

NODE=B051

 $\Sigma(1670)$ Bumps $I(J^P) = 1(?)$

OMITTED FROM SUMMARY TABLE

Formation experiments are listed separately in the preceding entry.

Probably there are two states at the same mass with the same quantum numbers, one decaying to $\Sigma\pi$ and $\Lambda\pi$, the other to $\Lambda(1405)\pi$.
See the note in front of the preceding entry.

 **$\Sigma(1670)$ MASS
(PRODUCTION EXPERIMENTS)**

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	CHG	COMMENT
≈ 1670 OUR ESTIMATE					
1670 ± 4		¹ CARROLL	76	DPWA	Isospin-1 total σ
1675 ± 10		² HEPP	76	DBC	$K^- N$ 1.6–1.75 GeV/c
1665 ± 1		APSELL	74	HBC	$K^- p$ 2.87 GeV/c
1688 ± 2 or 1683 ± 5	1.2k	BERTHON	74	HBC	Quasi-2-body σ
1670 ± 6		AGUILAR-...	70B	HBC	$K^- p \rightarrow \Sigma\pi\pi$ 4 GeV
1668 ± 10		AGUILAR-...	70B	HBC	$K^- p \rightarrow \Sigma 3\pi$ 4 GeV
1660 ± 10		ALVAREZ	63	HBC	$K^- p$ 1.51 GeV/c
• • • We do not use the following data for averages, fits, limits, etc. • • •					
1668 ± 10	150	³ FERRERSORIA81	OMEG	–	$\pi^- p$ 9.12 GeV/c
1655 to 1677		TIMMERMANS76	HBC	+	$K^- p$ 4.2 GeV/c
1665 ± 5		BUGG	68	CNTR	$K^- p, d$ total σ
1661 ± 9	70	PRIMER	68	HBC	See BARNES 69E
1685		ALEXANDER	62C	HBC	–0 $\pi^- p$ 2–2.2 GeV/c

NODE=B051M

NODE=B051M
→ UNCHECKED ←

OCCUR=2

 **$\Sigma(1670)$ WIDTH
(PRODUCTION EXPERIMENTS)**

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	CHG	COMMENT
67.0 ± 2.4		APSELL	74	HBC	$K^- p$ 2.87 GeV/c
110 ± 12		AGUILAR-...	70B	HBC	$K^- p \rightarrow \Sigma\pi\pi$ 4 GeV
135 ⁺⁴⁰ ₋₃₀		AGUILAR-...	70B	HBC	$K^- p \rightarrow \Sigma 3\pi$ 4 GeV
40 ± 10		ALVAREZ	63	HBC	+
• • • We do not use the following data for averages, fits, limits, etc. • • •					
90 ± 20	150	³ FERRERSORIA81	OMEG	–	$\pi^- p$ 9.12 GeV/c
52		¹ CARROLL	76	DPWA	Isospin-1 total σ
48 to 63		TIMMERMANS76	HBC	+	$K^- p$ 4.2 GeV/c
30 ± 15		BUGG	68	CNTR	
60 ± 20	70	PRIMER	68	HBC	+
45		ALEXANDER	62C	HBC	–0

NODE=B051W

NODE=B051W

OCCUR=2

 **$\Sigma(1670)$ DECAY MODES
(PRODUCTION EXPERIMENTS)**

Mode
$\Gamma_1 N\bar{K}$
$\Gamma_2 \Lambda\pi$
$\Gamma_3 \Sigma\pi$
$\Gamma_4 \Lambda\pi\pi$
$\Gamma_5 \Sigma\pi\pi$
$\Gamma_6 \Sigma(1385)\pi$
$\Gamma_7 \Lambda(1405)\pi$

NODE=B051215; NODE=B051

DESIG=1

DESIG=2

DESIG=3

DESIG=4

DESIG=5

DESIG=6

DESIG=7

**$\Sigma(1670)$ BRANCHING RATIOS
(PRODUCTION EXPERIMENTS)**

NODE=B051220

 $\Gamma(N\bar{K})/\Gamma(\Sigma\pi)$

VALUE	EVTS	DOCUMENT ID	TECN	CHG	COMMENT	Γ_1/Γ_3
<0.03		TIMMERMANS76	HBC	+	$K^- p$ 4.2 GeV/c	
<0.10		BERTHON 74	HBC	0	Quasi-2-body σ	
<0.2		AGUILAR-...	70B	HBC		
<0.26		BARNES	69E	HBC	+	$K^- p$ 3.9–5 GeV/c
0.025		BUGG	68	CNTR 0	Assuming $J =$ 3/2	
<0.24	0	PRIMER	68	HBC	+	$K^- p$ 4.6–5 GeV/c
<0.6		LONDON	66	HBC	+	$K^- p$ 2.25 GeV/c
<0.19	0	ALVAREZ	63	HBC	+	$K^- p$ 1.15 GeV/c
$\geq 0.5 \pm 0.25$		SMITH	63	HBC	-0	

NODE=B051R1

NODE=B051R1

 $\Gamma(\Lambda\pi)/\Gamma(\Sigma\pi)$

VALUE	EVTS	DOCUMENT ID	TECN	CHG	COMMENT	Γ_2/Γ_3
0.76 ± 0.09		ESTES	74	HBC	0	$K^- p$ 2.1,2.6 GeV/c
0.45 ± 0.15		BARNES	69E	HBC	+	$K^- p$ 3.9–5 GeV/c
0.15 ± 0.07		HUWE	69	HBC	+	
0.11 ± 0.06	33	BUTTON-...	68	HBC	+	$K^- p$ 1.7 GeV/c
• • • We do not use the following data for averages, fits, limits, etc. • • •						
$\leq 0.45 \pm 0.07$		TIMMERMANS76	HBC	+	$K^- p$ 4.2 GeV/c	
0.55 ± 0.11		BERTHON 74	HBC	0	Quasi-2-body σ	
0	0	PRIMER	68	HBC	+	See BARNES 69E
<0.6		LONDON	66	HBC	+	$K^- p$ 2.25 GeV/c
1.2	130	ALVAREZ	63	HBC	+	$K^- p$ 1.15 GeV/c
1.2		SMITH	63	HBC	-0	

NODE=B051R2

NODE=B051R2

 $\Gamma(\Lambda\pi\pi)/\Gamma(\Sigma\pi)$

VALUE	EVTS	DOCUMENT ID	TECN	CHG	COMMENT	Γ_4/Γ_3
<0.6		LONDON	66	HBC	+	$K^- p$ 2.25 GeV/c
0.56	90	ALVAREZ	63	HBC	+	$K^- p$ 1.15 GeV/c
0.17		SMITH	63	HBC	-0	

NODE=B051R3

NODE=B051R3

 $\Gamma(\Sigma\pi\pi)/\Gamma(\Sigma\pi)$

VALUE	EVTS	DOCUMENT ID	TECN	CHG	COMMENT	Γ_5/Γ_3
largest at small angles		ESTES	74	HBC	0	$K^- p$ 2.1,2.6 GeV/c
• • • We do not use the following data for averages, fits, limits, etc. • • •						
<0.2		² HEPP	76	DBC	-	$K^- N$ 1.6–1.75 GeV/c
0.56	180	ALVAREZ	63	HBC	+	$K^- p$ 1.15 GeV/c

NODE=B051R4

NODE=B051R4

 $\Gamma(\Lambda(1405)\pi)/\Gamma(\Sigma\pi)$

VALUE	EVTS	DOCUMENT ID	TECN	CHG	COMMENT	Γ_7/Γ_3
1.8 ± 0.3 to 0.02 ± 0.07		3,4 TIMMERMANS76	HBC	+	$K^- p$ 4.2 GeV/c	
largest at small angles		ESTES	74	HBC	\pm	$K^- p$ 2.1,2.6 GeV/c
3.0 ± 1.6	50	LONDON	66	HBC	+	$K^- p$ 2.25 GeV/c

NODE=B051R5

NODE=B051R5

• • • We do not use the following data for averages, fits, limits, etc. • • •0.58 \pm 0.20 17 PRIMER 68 HBC + See BARNES 69E

$\Gamma(\Sigma\pi)/\Gamma(\Sigma\pi\pi)$

<u>VALUE</u>					
varies with prod. angle					
1.39 ± 0.16					
2.5 to 0.24					
<0.4					
0.30 ± 0.15					

 Γ_3/Γ_5

<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>
5 APSELL	74	HBC	$K^- p$ 2.87 GeV/c
BERTHON	74	HBC	Quasi-2-body σ
4 EBERHARD	69	HBC	$K^- p$ 2.6 GeV/c
BIRMINGHAM	66	HBC	$K^- p$ 3.5 GeV/c
LONDON	66	HBC	$K^- p$ 2.25 GeV/c

NODE=B051R6
NODE=B051R6 $\Gamma(\Lambda(1405)\pi)/\Gamma(\Sigma\pi\pi)$

<u>VALUE</u>					
0.97 ± 0.08					
1.00 ± 0.02					
$0.90^{+0.10}_{-0.16}$					

 Γ_7/Γ_5

<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>
TIMMERMANS76	HBC		$K^- p$ 4.2 GeV/c
APSELL	74	HBC	$K^- p$ 2.87 GeV/c
EBERHARD	65	HBC	$K^- p$ 2.45 GeV/c

NODE=B051R7
NODE=B051R7 $\Gamma(\Lambda(1405)\pi)/\Gamma(\Sigma(1385)\pi)$

<u>VALUE</u>					
<0.8					

 Γ_7/Γ_6

<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>
EBERHARD	65	HBC	$K^- p$ 2.45 GeV/c

NODE=B051R8
NODE=B051R8 $\Gamma(\Lambda\pi\pi)/\Gamma(\Sigma\pi\pi)$

<u>VALUE</u>					
0.35 ± 0.2					

 Γ_4/Γ_5

<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>
BIRMINGHAM	66	HBC	$K^- p$ 3.5 GeV/c

NODE=B051R9
NODE=B051R9 $\Gamma(\Lambda\pi)/\Gamma(\Sigma\pi\pi)$

<u>VALUE</u>					
<0.2					

 Γ_2/Γ_5

<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>
BIRMINGHAM	66	HBC	$K^- p$ 3.5 GeV/c

NODE=B051R10
NODE=B051R10 $\Gamma(\Lambda\pi)/[\Gamma(\Lambda\pi) + \Gamma(\Sigma\pi)]$

<u>VALUE</u>					
<0.6					

 $\Gamma_2/(\Gamma_2+\Gamma_3)$

<u>DOCUMENT ID</u>	<u>TECN</u>			
AGUILAR-...	70B	HBC		

NODE=B051R11
NODE=B051R11 $\Gamma(\Sigma(1385)\pi)/\Gamma(\Sigma\pi)$

<u>VALUE</u>					
$\leq 0.21 \pm 0.05$					

 Γ_6/Γ_3

<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
TIMMERMANS76	HBC	$K^- p$ 4.2 GeV/c

NODE=B051R12
NODE=B051R12 **$\Sigma(1670)$ QUANTUM NUMBERS
(PRODUCTION EXPERIMENTS)**

<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>
$J^P = 3/2^-$	400	BUTTON-...	68	HBC	$\Sigma^0\pi$
$J^P = 3/2^-$		EBERHARD	67	HBC	$\Lambda(1405)\pi$
$J^P = 3/2^+$		LEVEQUE	65	HBC	$\Lambda(1405)\pi$

NODE=B051Q1

 **$\Sigma(1670)$ FOOTNOTES
(PRODUCTION EXPERIMENTS)**1 Total cross-section bump with $(J+1/2)$ Γ_{el} / $\Gamma_{total} = 0.23$.2 Enhancements in $\Sigma\pi$ and $\Sigma\pi\pi$ cross sections.3 Backward production in the $\Lambda\pi^- K^+$ final state.

4 Depending on production angle.

5 APSELL 74, ESTES 74, and TIMMERMANS 76 find strong branching ratio dependence on production angle, as in earlier production experiments.

NODE=B051
NODE=B051;LINKAGE=B
NODE=B051;LINKAGE=C
NODE=B051;LINKAGE=D
NODE=B051;LINKAGE=E
NODE=B051;LINKAGE=G

FERRER SORIA	81	NP B178 373
CARROLL	76	PRL 37 806
HEPP	76	NP B115 82
TIMMERMANS	76	NP B112 77
APSELL	74	PR D10 1419
BERTHON	74	NC 21A 146
ESTES	74	Thesis LBL-3827
AGUILAR-...	70B	PRL 25 58
BARNES	69E	BNL 13823
EBERHARD	69	PRL 22 200
HUWE	69	PR 181 1824

A. Ferrer Soria <i>et al.</i>	(CERN, CDEF, EPOL+)
A.S. Carroll <i>et al.</i>	(BNL)
V. Hepp <i>et al.</i>	(CERN, HEID, MPIM)
J.J.M. Timmermans <i>et al.</i>	(NIJM, CERN+) JP
S.P. Apsell <i>et al.</i>	(BRAN, UMD, SYRA+)
A. Berthon <i>et al.</i>	(CDEF, RHEL, SACL+)
R.D. Estes	(LBL)
M. Aguilar-Benitez <i>et al.</i>	(BNL, SYRA)
V.E. Barnes <i>et al.</i>	(BNL, SYRA)
P.H. Eberhard <i>et al.</i>	(LRL)
D.O. Huwe	(LRL)

REFID=32189
REFID=31760
REFID=32187
REFID=32188
REFID=32183
REFID=31745
REFID=32185
REFID=20692
REFID=32180
REFID=32181
REFID=32019

BUGG	68	PR 168 1466	D.V. Bugg <i>et al.</i>	(RHEL, BIRM, CAVE) I	REFID=31601
BUTTON-...	68	PRL 21 1123	J. Button-Shafer	(MASA, LRL) JP	REFID=32178
PRIMER	68	PRL 20 610	M. Primer <i>et al.</i>	(SYRA, BNL)	REFID=32179
EBERHARD	67	PR 163 1446	P. Eberhard <i>et al.</i>	(LRL, ILL) IJP	REFID=32192
BIRMINGHAM	66	PR 152 1148	M. Haque <i>et al.</i>	(BIRM, GLAS, LOIC, OXF+)	REFID=31692
LONDON	66	PR 143 1034	G.W. London <i>et al.</i>	(BNL, SYRA) IJ	REFID=11774
EBERHARD	65	PRL 14 466	P.H. Eberhard <i>et al.</i>	(LRL, ILL) I	REFID=32174
LEVEQUE	65	PL 18 69	A. Leveque <i>et al.</i>	(SACL, EPOL, GLAS+) JP	REFID=32190
ALVAREZ	63	PRL 10 184	L.W. Alvarez <i>et al.</i>	(LRL) I	REFID=32171
SMITH	63	Athens Conf. 67	G.A. Smith	(LRL)	REFID=32172
ALEXANDER	62C	CERN Conf. 320	G. Alexander <i>et al.</i>	(LRL) I	REFID=32170
